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Growth rings and age in *Vella pseudocytisus* subsp. *paui* (Brassicaceae)

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Introduction

Age characterises the population structure and determines its dynamics. The most accurate age estimation of woody plants can be obtained through dendrochronological techniques when the rings are well marked and constitute a reliable record of each annual growing season.

Our work has focused on *Vella pseudocytisus* subsp. *paui* Gómez Campo, an endemic shrub which grows in a continental semiarid climate in the center of the Iberian Peninsula (Community of Aragón) (Figure 1), with only two extant populations and recently enlisted as Endangered in the Spanish Red Data List (Moreno, 2008).

The objective of this work is to support with dendrochronological data the demographic monitoring carried out over the last ten years (Domínguez *et al.*, in press), in order to assess the study of its demographic performance (vital rates, population dynamics, survival trends). Due to the fact that the species is strictly protected under the Aragonian law, we were able only to collect individuals known to be dead or removed by agricultural practices from both populations over the last ten years. After checking the existence of defined boundaries between rings, we have measured them in 126 trunk sections corresponding to 61 individuals (see Table 1).

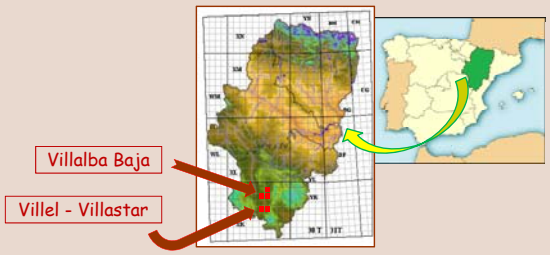

Figure 1. Distribution map of *Vella pseudocytisus* subsp. *paui* showing its two extant populations

Materials and Methods

The most complete sampling was carried out in Villastar where a field was ploughed without authorization in 2007 and dozens of individual *Vella pseudocytisus* subsp. *paui* were uprooted and dried.

Figure 2. Ploughed field in Villastar where uprooted specimens can be observed

From these, 35 individuals were collected being representative of all adult size classes (# 15 to 49 in Table 1).

The majority of the other sampled stems were dead individuals found by chance in Villalba Baja and Villel over time. The maximum height, maximum diameter at the shrub top and its perpendicular diameter were recorded in the field to calculate biovolume, and trunks were brought to the laboratory for further processing. In most cases, two axis sections (in some cases up to 6) were then obtained from each specimen: one near the root collar and the other close to the apex of the stem. In every section at least two radii were measured.

Figure 3. Left: symmetrical trunk sections. Right: some of the common anomalies in trunks, i.e. presence of lobes and eccentricity

Growth rings of each radius were measured using a LINTAB measuring device coupled to a stereomicroscope and the TSAPWin software. As a result of the short growth ring series available, the use of statistical crossdating techniques was impossible. Therefore, the presence of discontinuous or multiple rings as well as the dating of series were performed by the visual analysis of overlap graphs.

References

•Domínguez, F., Moreno, J.C. & Pérez, N. (*in press*). Dinámica demográfica de la arnachilla. *In*: Lozano, F., Guzmán, D. & Moreno, J.C. (eds.), *Biología de la Conservación de una planta amenazada en Aragón: el crujiente* (Vella pseudocytisus *L. subsp.* paui). Consejo de Protección de la Naturaleza de Aragón.

•Moreno, J.C., coord. (2008). *Lista Roja 2008 de la Flora Vascular Española / 2008 Red List of Spanish Vascular Flora*. Ministerio de Medio Ambiente y Medio Rural y Marino, Madrid.

•Génova, M. & Sánchez, J. (*in press*). La longevidad de *Vella pseudocytisus* subsp. *paui*: estudios dendrocronológicos. *In*: Lozano, F., Guzmán, D. & Moreno, J.C. (eds.), *Biología de la Conservación de una planta amenazada en Aragón: el crujiente* (Vella pseudocytisus *L. subsp.* paui). Consejo de Protección de la Naturaleza de Aragón.

•Schweingruber F.H. (2006). Anatomical characteristics and ecological trends in the xylem and phloem of Brassicaceae and Resedaceae. *Iawa Journal* 27(4): 419-442.

Results and Discussion

Vella pseudocytisus subsp. *paui* is a relatively long-lived species, which a mean maximum age is over 30 years and close to 50 in the eldest individuals (Génova & Sánchez, in press; see Table 1). Such longevity is a very unusual trait in the mustard family, mainly composed by annual or short-lived herbs, and in which only a few genera have evolved to expand their life span and gain high size becoming woody short phanerophytes. This evolution has only taken place in the Mediterranean and in Macaronesia (Schweingruber, 2006).

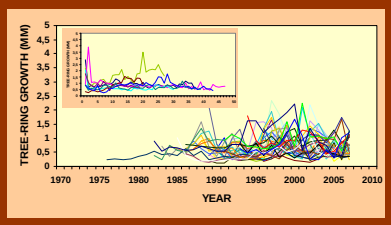

Figure 4. Dated growth series in Villastar (right) and growth series in Villalba Baja (top left)

The 35 individuals from Villastar resulted nearly contemporary (average age of 19 ± 4.3 years). The eldest sample was estimated to be 32 years old. That most likely tells us that around 1975 the agricultural use ceased -and grazing also declined-, and most of the collected plants germinated at the end of the 80s decade. On the contrary, individuals from Villalba Baja were much older (30 ± 0.9 years on average) and show greater ring growth. Sampling in this population is small and not a particularly great representation (only 9 stems: # 14, 54-61 in Table 1), but is still a sufficient number to draw some hypotheses: individuals possibly died of old age and their highest growth indicates more favorable conditions for development. Although the habitat in Villalba Baja seems to make the survival of *Vella pseudocytisus* more difficult (steep slopes and poor soil development), a lesser competence for resources and the scarcity of grazing have possibly allowed higher growth of the species.

The remarkable longevity found supports a scenario in which adult individuals are of great importance for the maintenance of populations. According to a "remnant dynamic", reproductive adult individuals can spare unfavorable periods for the establishment of new cohorts. Such dynamic may suppose an enhancement for the plant in the light of Global Change.

#	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61
Height (cm)	69	85	25	35	18	43	39	23	75	24	16	27	110	115	36	31	33	26	35	38	31	33	34	38	25	11	42	46	34	34	38	46	46	47	46	42	49	56	69	64	46	80	77	59	54	58	62	64	93	108	62	108	54	77	65	23	100	-	90	-	-
Ø (cm)	4	2	1	1	1	2	1	1	3	1	1	1	3	3	2	2	3	1	2	2	3	2	3	2	3	2	3	3	4	4	3	3	3	3	4	4	3	4	5	2	2	2	2	1	2	3	3	2	4	3	2	4	3	2	3	3	5	4	8	4	4
Biovolume (dm^3)	853	751	24	39	5	150	88	15	861	8	6	41	4354	4425	46	59	67	39	61	63	55	63	89	95	49	93	219	308	105	79	101	201	177	174	178	224	203	311	301	123	78	252	130	56	104	29	132	291	977	703	327	1677	58	269	596	73	390	-	-	-	-
Age	28	10	6	30	16	21	17	11	33	9	7	15	32	45	20	19	18	16	18	19	18	11	12	19	18	19	17	17	22	21	17	22	24	21	29	25	32	26	22	19	17	22	12	15	23	14	17	15	26	27	20	22	33	19	20	39	43	37	27	47	30

Table 1. Some measured characteristics in sampled individuals: height and diameter of the trunk, biovolume and age (number of rings)

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